IMPROVING FIELD GERMINATION OF ARTIFICIALLY SOWN PONDEROSA PINE AND DOUGLAS-FIR SEED BY USING SEED WAFERS AND RODENT BARRIERS

A Thesis

Presented in Partial Fulfillment of the Requirements for the

DEGREE OF MASTER OF SCIENCE

With a

Major in Forest Resources

In the

GRADUATE SCHOOL

UNIVERSITY OF IDAHO

By

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ABSTRACT

Encapsulating conifer seed in vermiculite seed wafers for improved forest regeneration has been pursued by forestry researchers since 1974. This method of forest regeneration is a potential alternative to broadcast seeding and tree planting methods.

This project was conducted to determine the effects of encapsulation on germination of ponderosa pine (Pinus ponderosa Laws) and Douglas-fir (Pseudotsuga menziesii Biessn.) Franco) seed, and first year survival of the seedlings. Additionally , two rodent barriers, plastic sheltercones and Vexar mesh cones, were tested for their effects on seed germination, seedling survival, and seedling height growth.

Encapsulating the seed caused significantly improved germination of seed for both species in the first field study, and for ponderosa pine in the second field study. Significant improvements in germination were obtained when barriers were used, thus indicating some seed protection from rodents and birds. However, seedlings inside sheltercones had a significantly higher rate of mortality than those under the Vexar cones or with no protection treatments. The cause was determined to be partially due to increased temperatures inside the sheltercones. Temperature inside the sheltercones approached lethal levels during the hottest part of the summer day. Neither encapsulation nor physical barriers significantly effected seedlings height growth for 3-month and 15-month seedlings.

Study Site

The study took place on the Flat Creek Unit of the University of Idaho Experimental Forest, Harold Osborne provided valuable timber sites for the field studies and provided the fencing material and labor.

Douglas-fir Plot

The plot for Douglas-fir was located on Unit 1-4-6 of the University of Idaho Experimental Forest. This unit was clearcut harvested, using cable yarding, in the summer of 1980 and broadcast-burned for site preparation the following fall. The burning was relatively cool, resulting in 50% duff reduction and leaving many logs on the site.

The 0.4 hectare plot (fig. 4) was located on the northeast side of a large draw, in the middle of the unit, at an elevation of approximately 950 meters. The slope varied from 5% to 30% with an average of 20%. This site was in a Thuja plicata- Pachistima myrsinites habitat type (Daubenmire and Daubenmire 1968). Soils for the site were classified as very deep, moderately well-drained Helmer silt loam(Barker 1981). They were not compacted by the timber harvesting.

The plot was enclosed with a 4-strand and cedar-post barb wire fence to exclude cattle. The cattle were allowed on the unit for summer grazing, but not within the plot. The fence was not designed to exclude large wildlife, such as deer and elk.

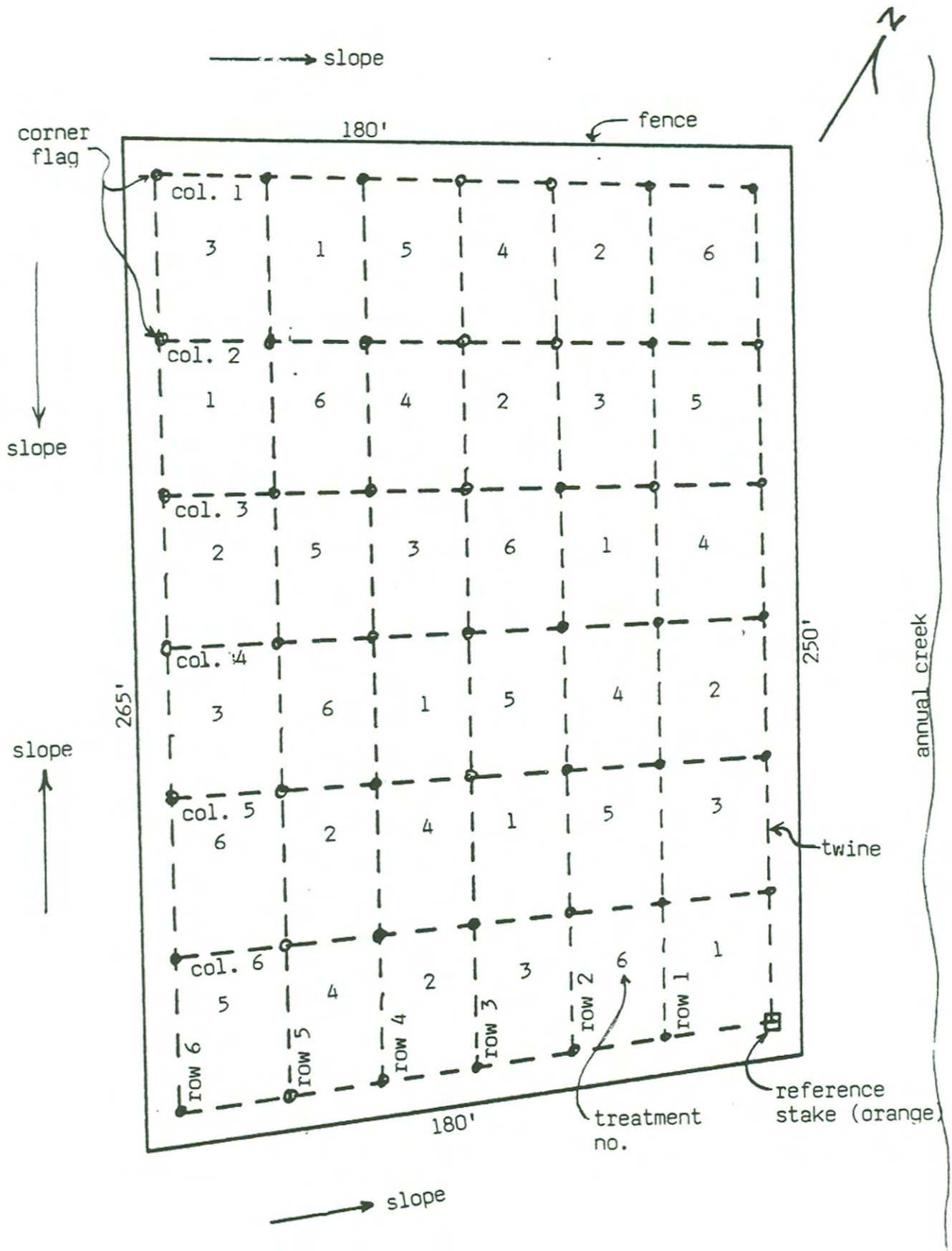


Figure 5: Map of the Douglas-fir plot of the 1981 field study.

Ponderosa Pine Plot

The plot for ponderosa pine was located on Unit 1-6-1 of the Brown's Meadow area of the University of Idaho Experimental Forest, approximately 1 kilometer south of the Douglas-fir plot. This unit was also clearcut harvested during the summer of 1980. Grounding skidding equipment was used for yarding the logs. The unit was broadcast-burned the following fall. This burn was very hot, resulting in almost complete duff removal in the lower half of the plot. In addition, the soils were fairly compacted from the yarding activity.

This plot (fig. 5) was located on top of a ridge at the east end of the unit. Slope varied from 0% on half of the plot to 15% on the lower half. Elevation was approximately 975 meters. Habitat type was the dry end of Abies grandis-Pachistima myrsinites , as classified by Daubenmire and Daubenmire (1968). Soils for the site were shallow with a weathered-in-place granitic bedrock ranging from 20 cm to 1 meter below the soil surface. The soil type was also a Helmer silt loam (Barker 1981), but much more shallow than on the Douglas-fir plot.

Field Study Activities

Both plots were set up in mid-April of 1981. Forty-nine man-hours were required to lay out each plot on

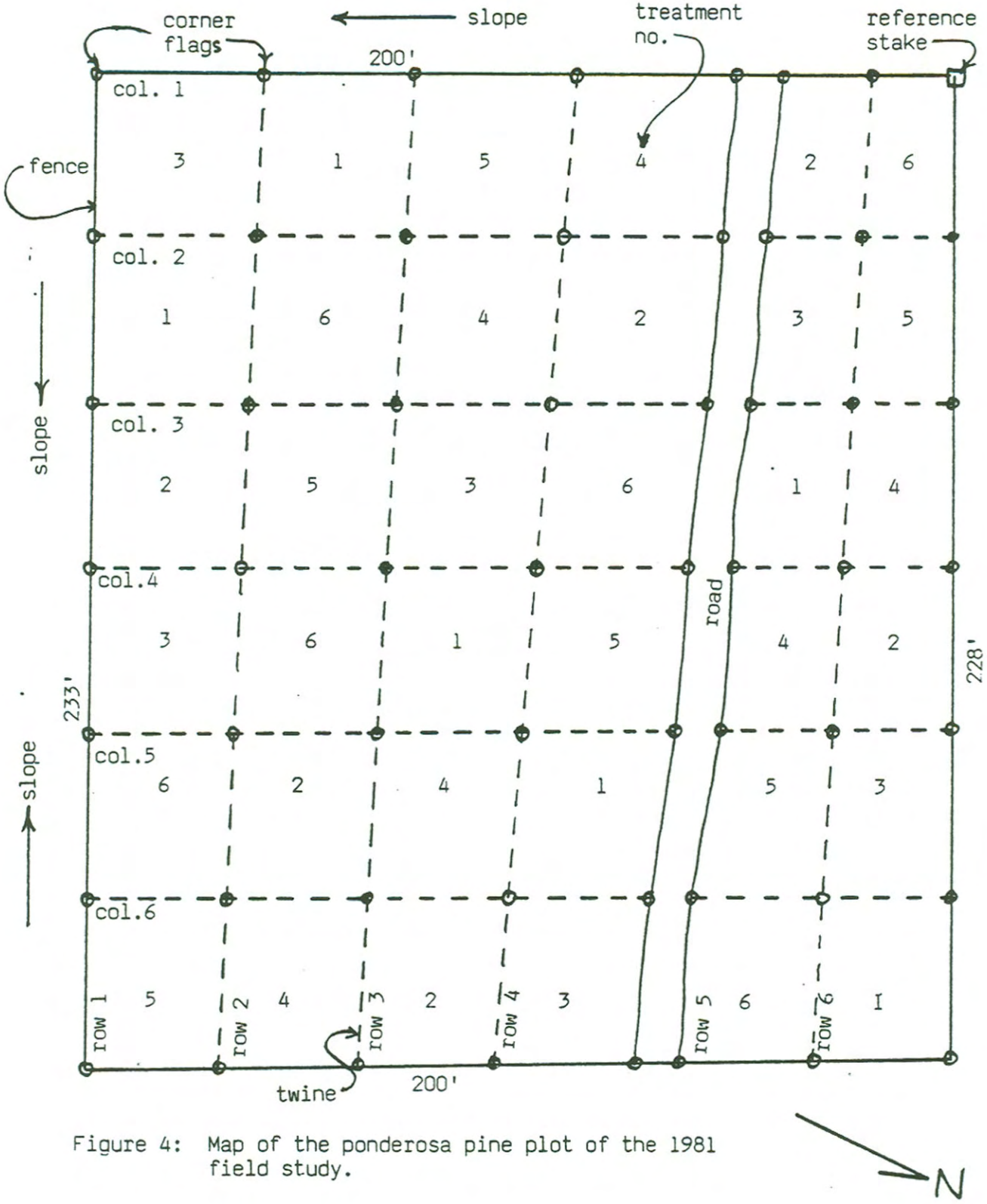


Figure 4: Map of the ponderosa pine plot of the 1981 field study.

the ground, map the location and dimensions of the plot, determine the site characteristics, and sow the seed and set up the barriers. Three people were required to carry out these activities.

At the time of establishment, the weather conditions could best be described as very wet. Rain and snow showers left the soils in both plots at saturation levels, with the soil temperature averaging 4 degrees centigrade.

Each seed wafer or bare seed was sown in the center of a 30 cm by 30 cm square scalp created with the side of a hoedad. The scalp was of sufficient depth to expose bare mineral soil. The scalps were distributed evenly over each experimental cell.

Data Collection

Three months after sowing of the seed, and again at 15 months, the number of live seedlings was counted in each experimental cell. Using the counts, the following data was calculated for each experimental cell:

$$\%GS = \text{no. live seedlings/no. seed sown}$$

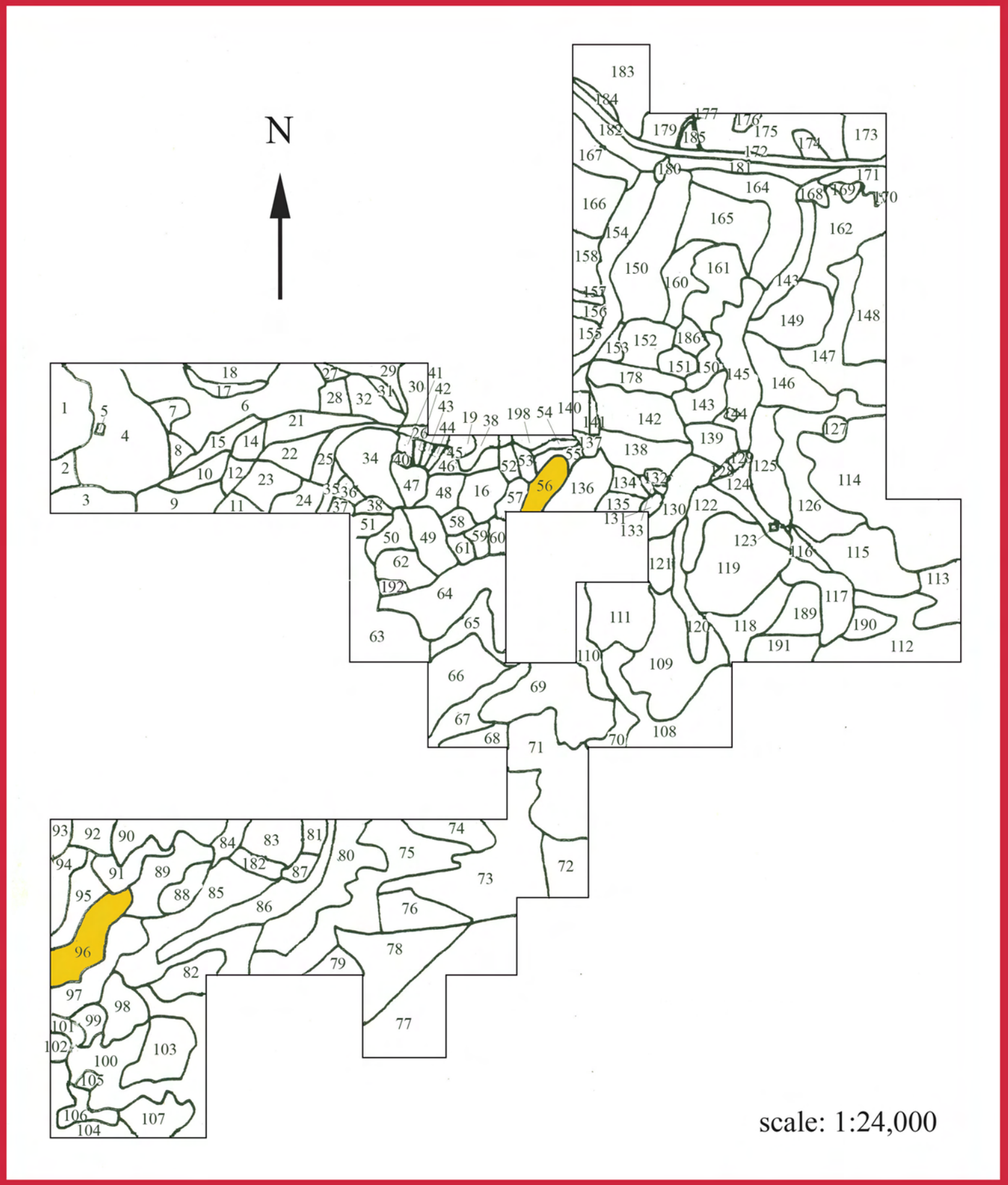
$$\%M = (\text{seedlings 3 mos} - \text{seedlings 15 mos})/\text{seedlings 3 mos}$$

where: %GS = % germination and survival

%M = % mortality 3 to 15 months.

Stand Map of the
Flat Creek Unit,
College of Forestry,
Experimental Forest
1986

Study Sites Highlighted are for Carl Dirk's Areas of Research



By finding the stand number
on the table for the map, you are able to then find the stand number on the map an see where the research took place on the experimental forest. This map and table came from
A Combined Report For Fiscal Years 1980 Through 1986

By
Forest Manager,
Harold Osborne
The maps were edited by
Rachel Voss

TABLE 6. AN EXPLANATION OF CODES USED IN TABLES 6-1 AND 6-2.

HARVEST ACTIVITY CODES

CC - CLEARCUT
SHWD - SHELTERWOOD
ST - SEEDTREE
SE - SELECTION
T - THINNING
LT - LOW THINNING
N - NO HARVESTING
IMP - IMPROVEMENT CUT
P - CUT PRIOR TO FY80

REFORESTATION CODES

P - PLANTED
NR - NATURAL REGENERATION
IP - INTERPLANT

SITE PREPARTAION CODES

BB - BROADCAST BORD
DP&B - DOZER PILE AND BURN
L&S - LOP AND SCATTER
JPB - JACKPOT BURN
HPB - HAND PILE AND BURN

LOGGING METHOD CODES

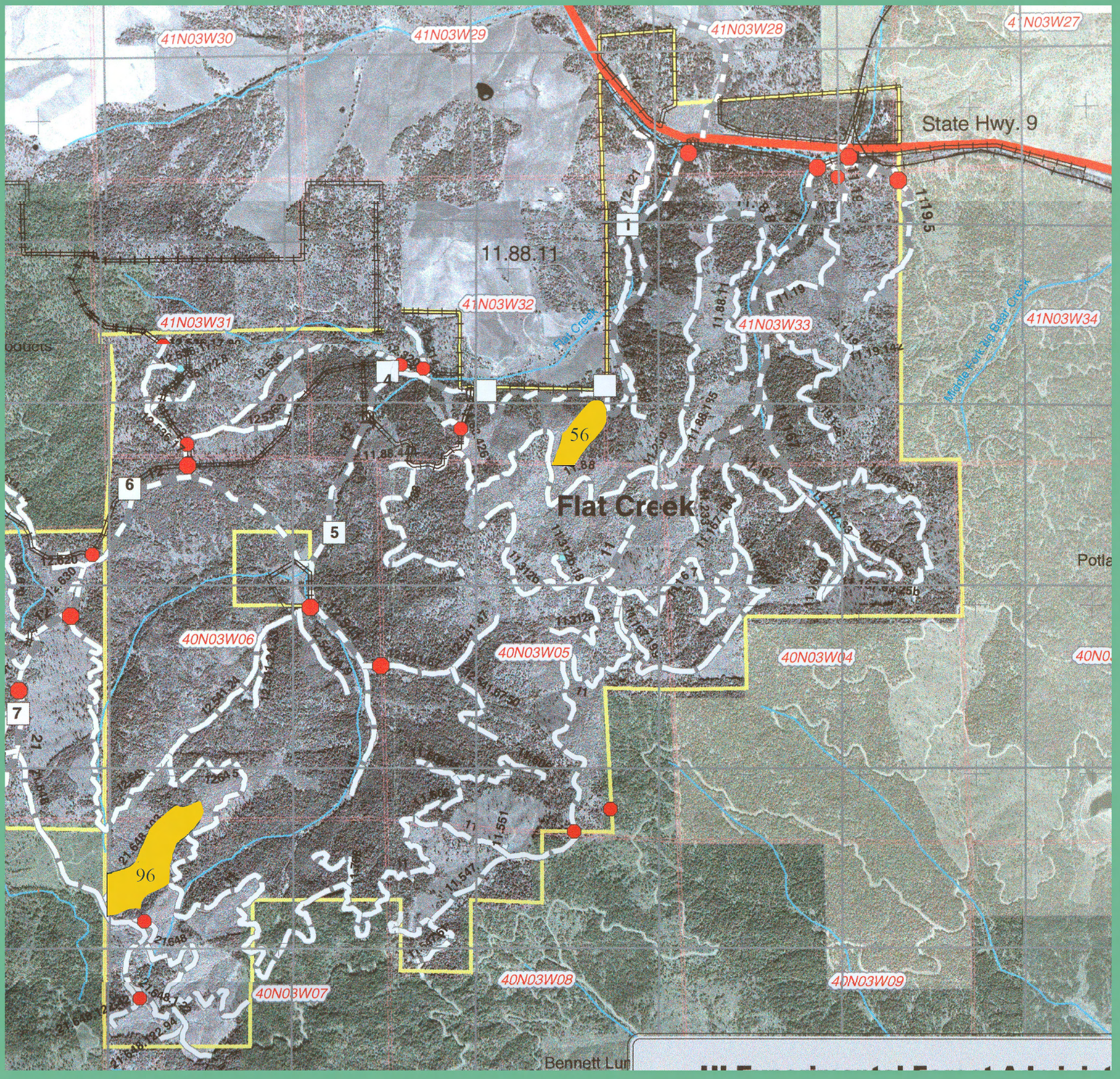
C - CABLE LOGGING
G - GROUND SKIDDING
H - HORSE LOGGING

TABLE 6-1. MANAGEMENT ACTIVITY RECORD FOR STANDS OF THE EXPERIMENTAL FOREST
COLLEGE OF FORESTRY, RANGE AND WILDLIFE, UNIVERSITY OF IDAHO

STAND #	MAP #	STAND DESCRIPTION	ACRES	HARVEST ACTIVITY CODE	FY HARVEST	SLASH/ SITE PREP CODE	FY PREP	REFOREST CODE	FY REFOREST	LOGGING METHOD
10101	185	SILVI DEMO SHELTERWOOD	6	SHWD	75	DP&B	75	NR	75	G
10102	151	SILVI DEMO SEEDTREE	5	ST	75	DP&B	75	NR	75	G
10106	150	DIAMETER LIMIT CUT		P	75					
10403	60	SECOND CLEARCUT STRIP	4	CC	79	BB	79	NR	81	C
10404	61	FIRST CLEARCUT STRIP	4	CC	79	BB	81	NR&P		C
10114	174	MINI SKIDDER BY RAILROAD	4.2	T	80	L&S	86	NR	86	G
10406	56	ZIMMERMAN SEED TREE #2	13.7	ST	80	BB	81	NR		
10408	16	ZIMMERMAN SEED TREE #1	12	ST	80	BB	81	NR	81	C
10411	48	ZIMMERMAN CLEARCUT	8	CC	80	BB	81	P	81	C
10510	71	CLEARCUT / RELOG	44	CC	80	BB	81	P	81	G
10601	96	AMOEBA CLEARCUT	22	CC	80	BB	81	P	81	G
10602	102	BENNY'S LINE STRIP	4	CC	80	BB	81	P	81	C
10606	99	SEED TREE	5	ST	80	DP&B	80	NR	80	G
10608	95	CEDAR POLE SALE	18	CC	80	BB	82	P	82	G
10609	84	SEED TREE WITH PEELERS	15	ST	80	BB	81	NR	81	G
10609	89	SEED TREE NORTH	6	ST	80	DP&B	81	NR	81	G
10106	150	GF SHELTERWOOD	8	SHWD	81	DP&B	83	NR	83	G
10416	38	CLEARCUT ABOVE 10418	2	CC	81	DP&B	82	P	82	G
10417	37	SPICER'S LINE SKID CLEARCUT	2.7	CC	81	BB	82	P	82	C

The first number is the unit, second number is the subcomponents, and the third number is the stand number.

so... find the 3 digit stand number, and then find the 2 digit map number on the maps to locate a study area.



Flat Creek Unit-2004 map

Location of Complete Research:

Author & Title: Dirks, Carl E.
Improving Field Germination of Artificially Sown Ponderosa Pine and Douglas-Fir Seed by Using Seed Wafers and Rodent Barriers

University of Idaho Library:

Call Number- SD397.P6115D57

College of Natural Resources:

Department- Forest Resources

Other Sources: